Open Manufacturing Overview

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ARPA-E METALS Annual Meeting | Additive Manufacturing Panel
Detroit, MI

August 23, 2016

New manufacturing technologies: perception is *not* reality

Perception: PROMISE

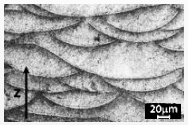
Greater component design flexibility

Lower buy-to-fly ratio

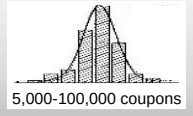
Improved time efficiency and legacy capability

Reality: CHALLENGE

Current manufacturing environment does not capture process data



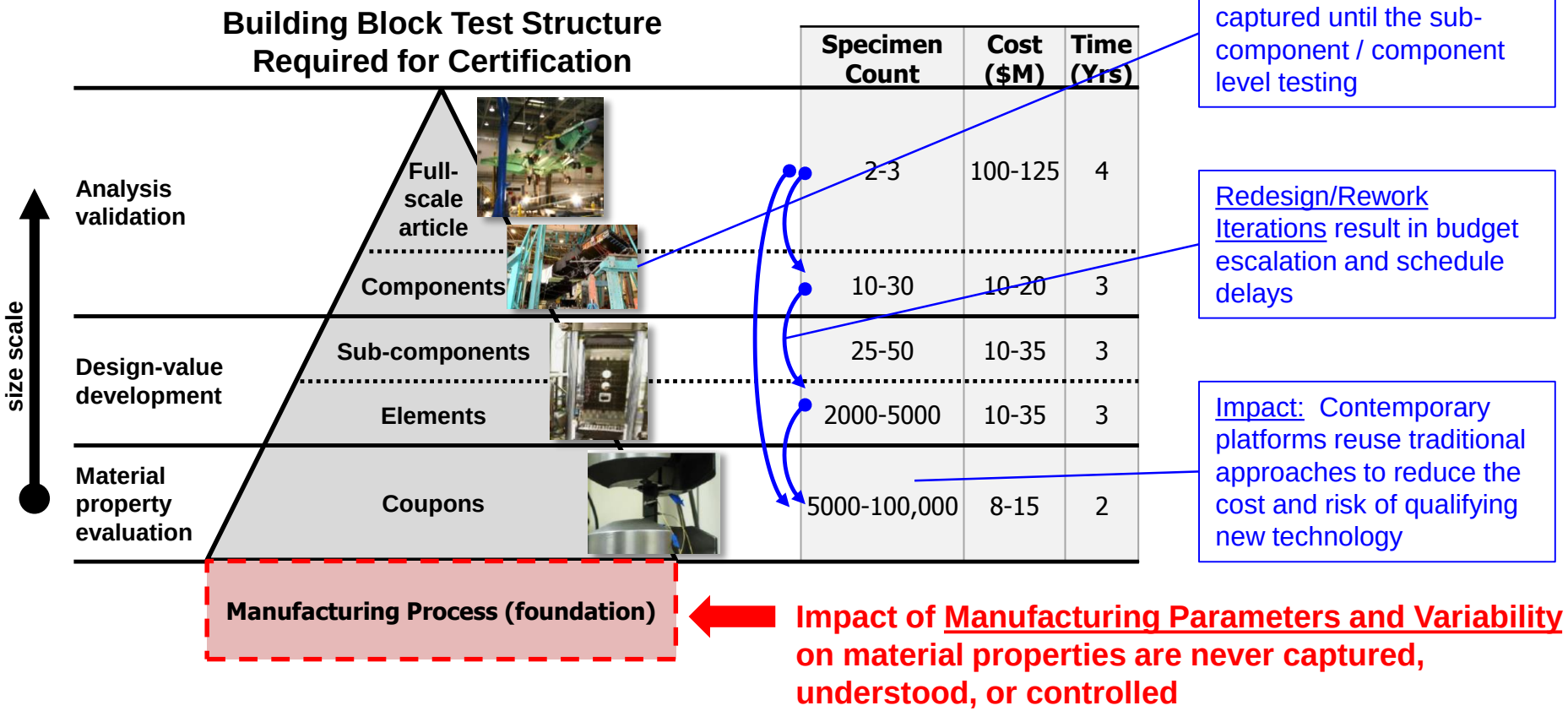
Poor understanding and control of materials, machines, and processes



"Make and break" qualification approach is too costly

Challenges are barrier to transitioning technologies to production

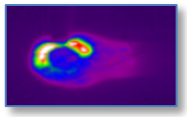
Current Approach Does Not Capture Impact of Manufacturing Variability Across Size Scales



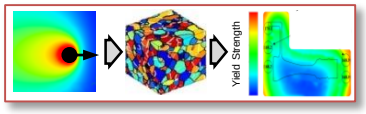
Comprehensive understanding of manufacturing variation at different scales is needed

OM Approach and Goals

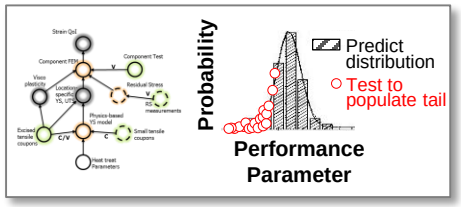
In-situ probabilistic sensing and routine data-capture capabilities transferred to manufacturing environment



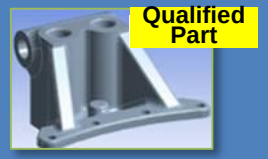
Maturing multi-physics and data-based models allow for understanding of process/microstructure/property relationships



New probabilistic frameworks and verification and validation techniques can link data sources and simulation modules to output product performance with quantified uncertainty

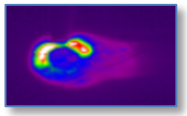


Location specific probabilistic description of product performance for rapid qualification



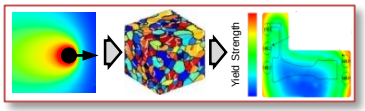
OM Efforts in Additive Manufacturing

Parameterization



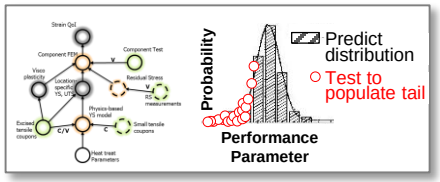
Early process quantification & capture

Predict



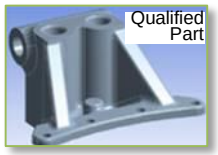
Process-material-performance

Targeted testing



Build confidence

Accelerate process maturity

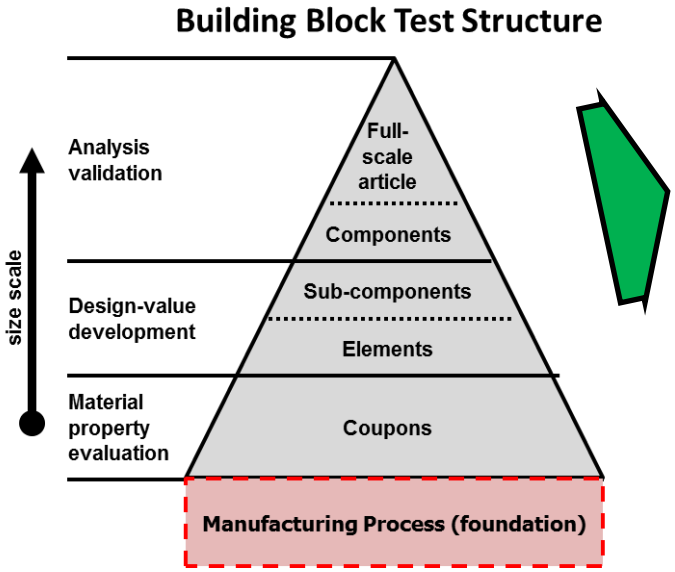


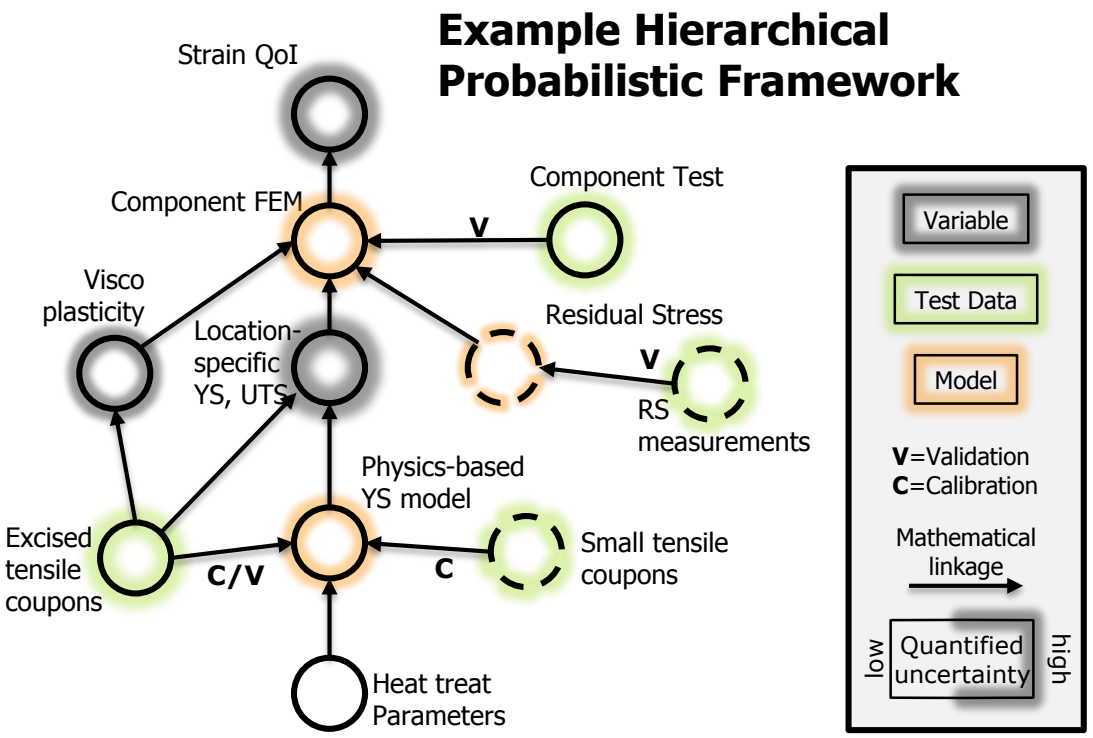
Qualification and systematic updating

Focus	Brief Description
RLCAM Rapid Low Cost Additive Mfg	First-principles materials models connected in a probabilistic software framework for physics-based predictions of the DMLS process
tiFAB Titanium Fabrication	Fully explore process window with scientific process models and minimal testing to determine key parameters that impact quality of manufactured product
MDF Manufacturing Demonstration Facility	Development, qualification, and implementation of enabling technologies for adoption of manufacturing processes

OM: Build and demonstrate rapid qualification technologies with comprehensive capture, analysis, and control of manufacturing variability

The OM qualification framework improves ability to rely on computational tools





Probabilistic qualification assessment and uncertainty reduction will help make decisions

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